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Robust Passive Sonar

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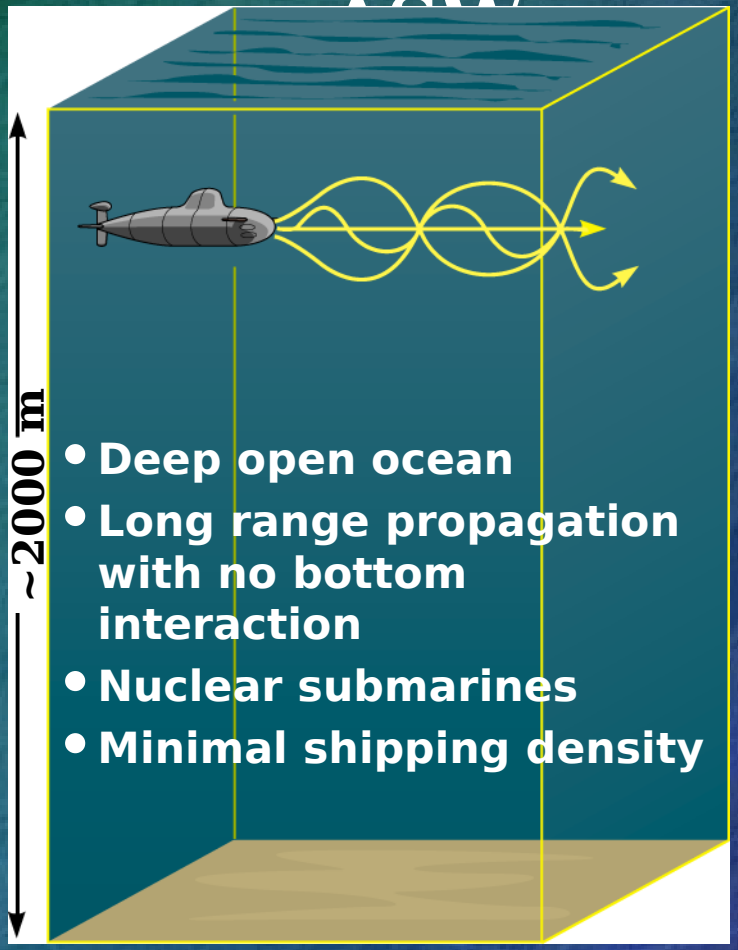
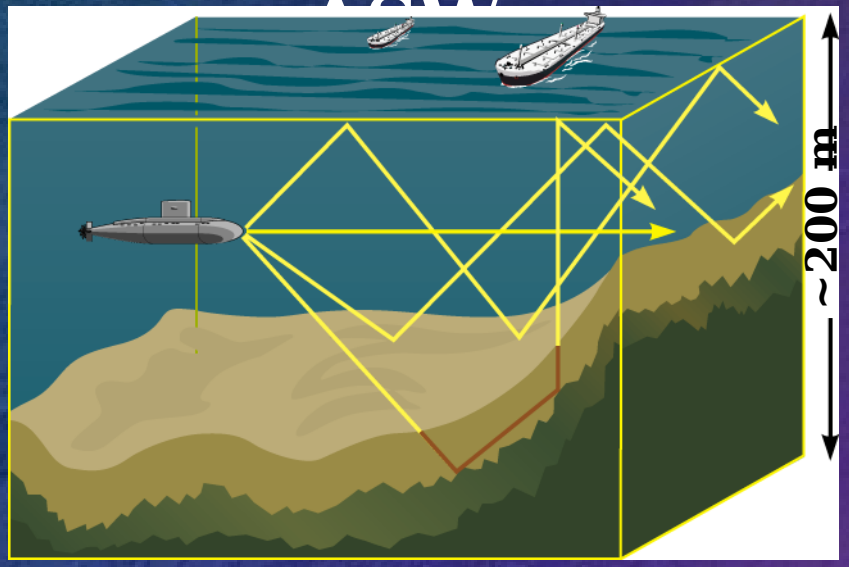
Anti-Submarine Warfare (ASW)

Cold War ASW



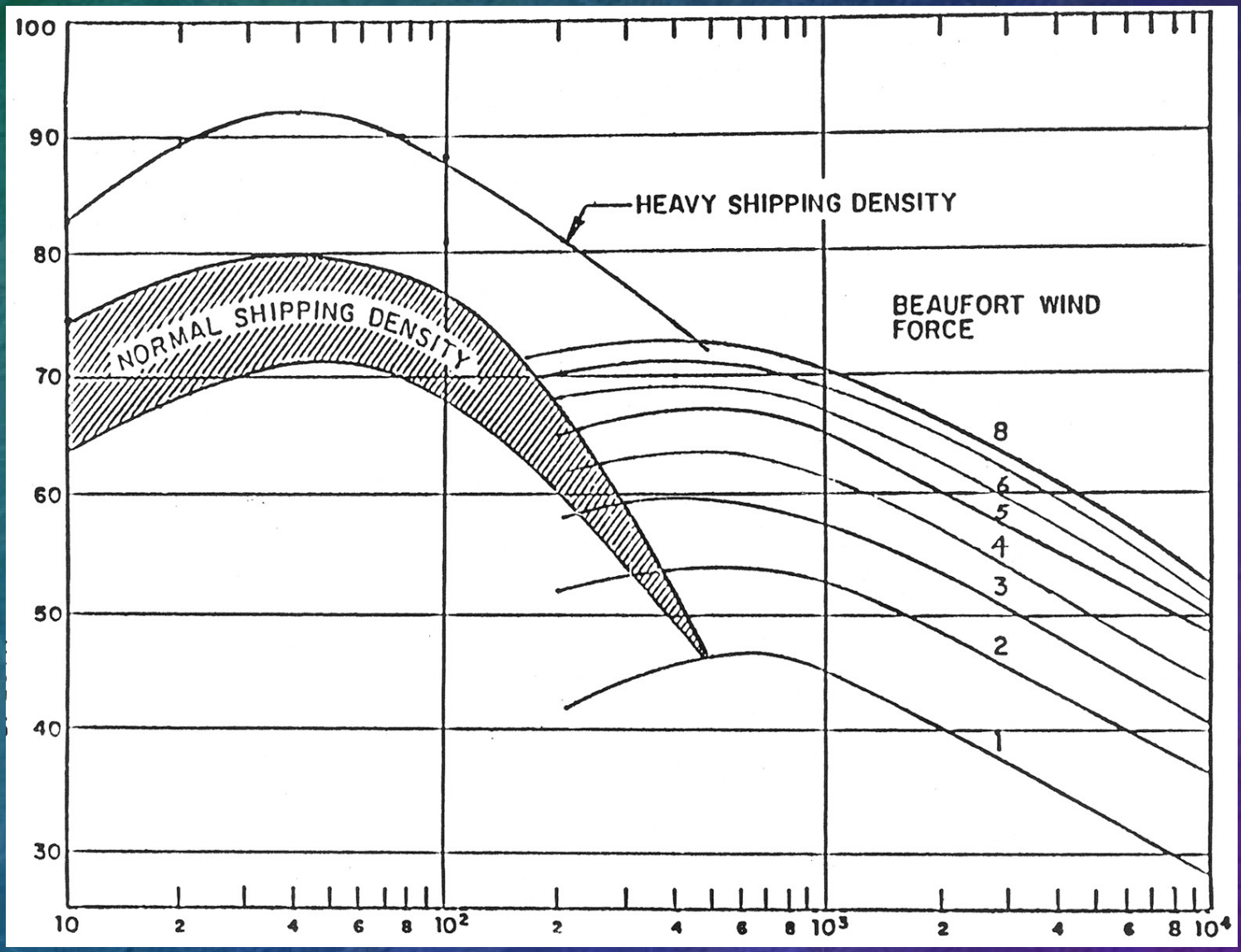
- Deep open ocean
- Long range propagation with no bottom interaction
- Nuclear submarines
- Minimal shipping density

Current Littoral ASW



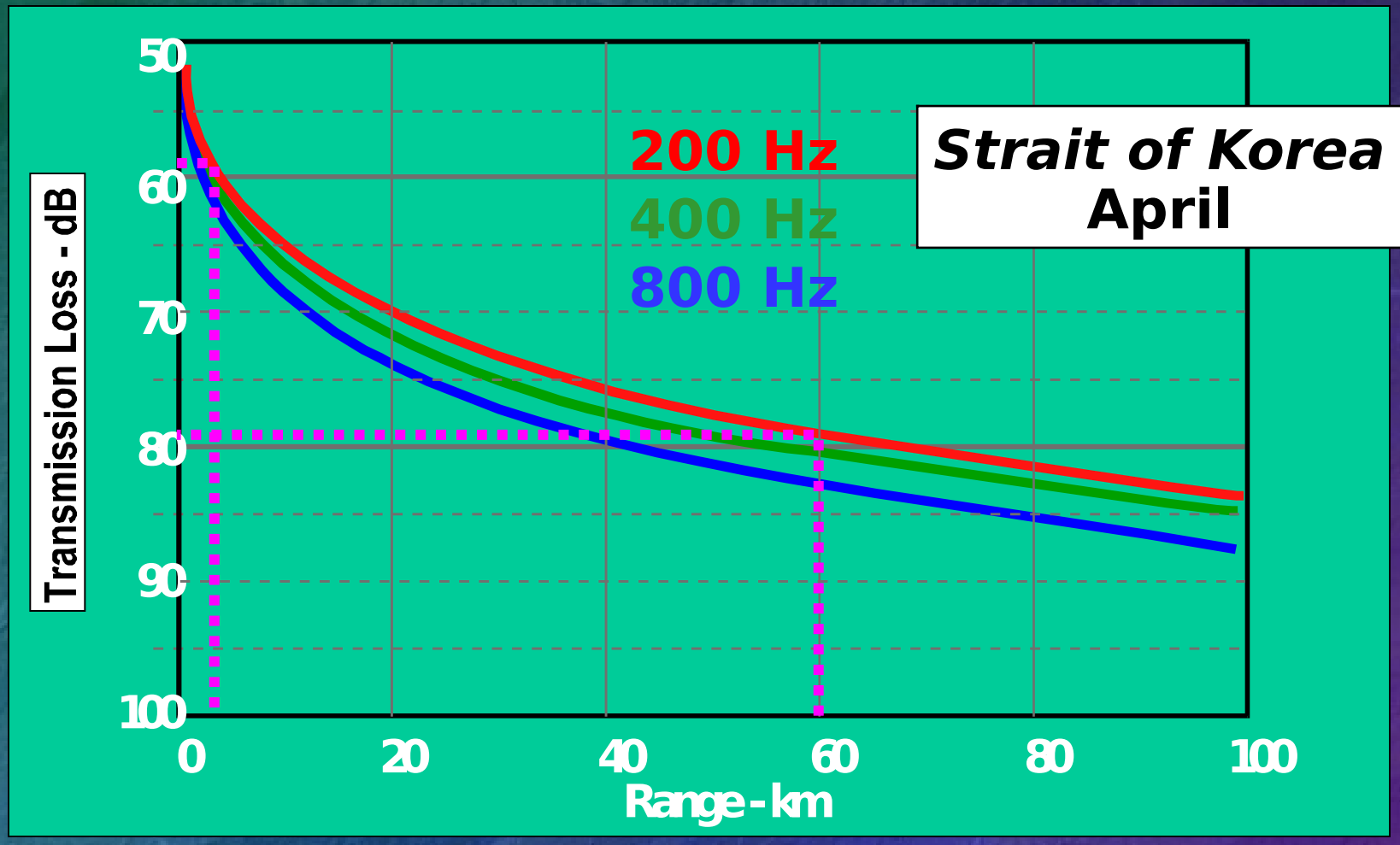
- Shallow water coastal regions
- Multipath propagation with significant attenuation
- Quiet diesel-electric submarines
- Significant shipping noise interference
- Dynamic engagements

Littoral ASW Implications



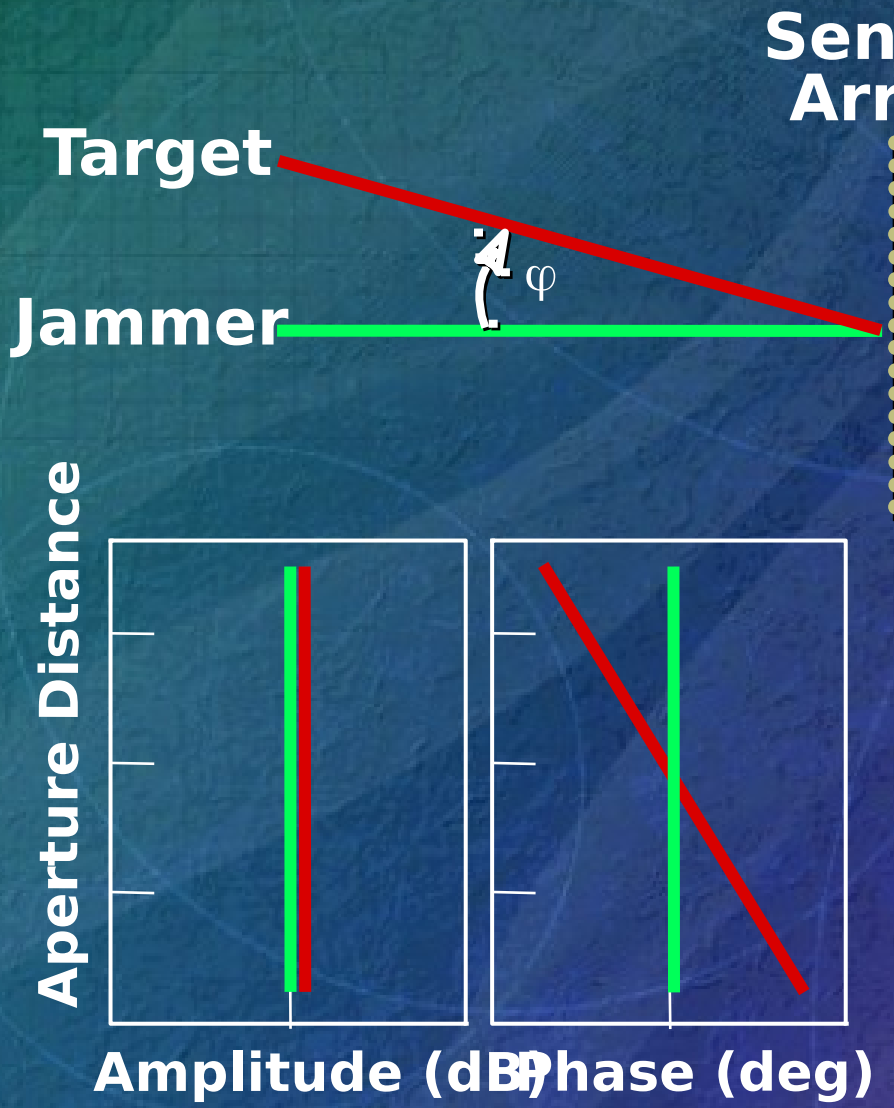
Average Ambient Noise Spectrum Levels (Wenz, 1962)

Littoral ASW Implications



Sensitivity loss due to heavy shipping density can produce dramatic reductions in detection range !

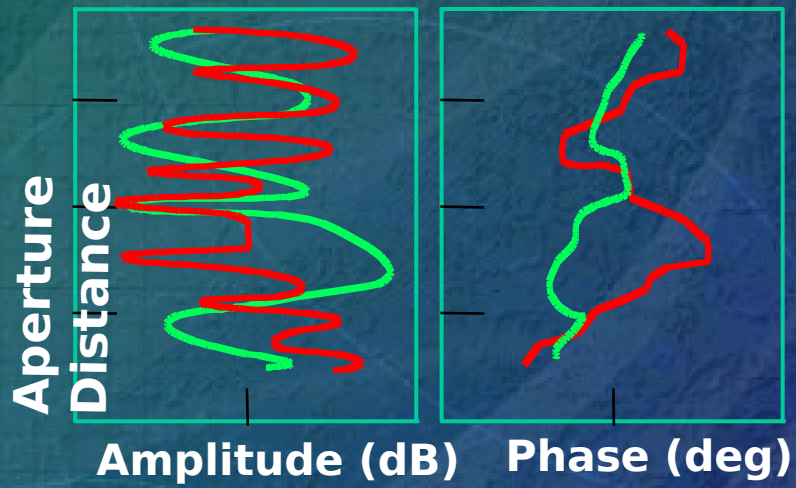
Conventional Beamforming



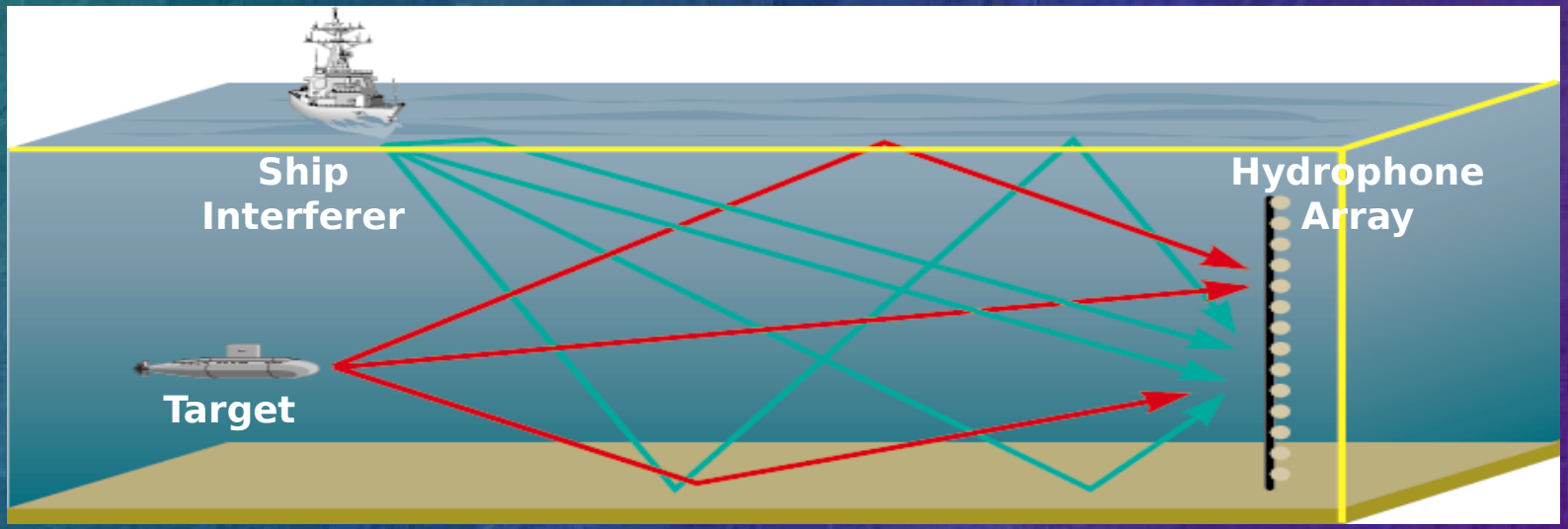
Free Space
Propagatio
n (Far-field)

Field Pattern
Across Aperture

Matched Field Processing

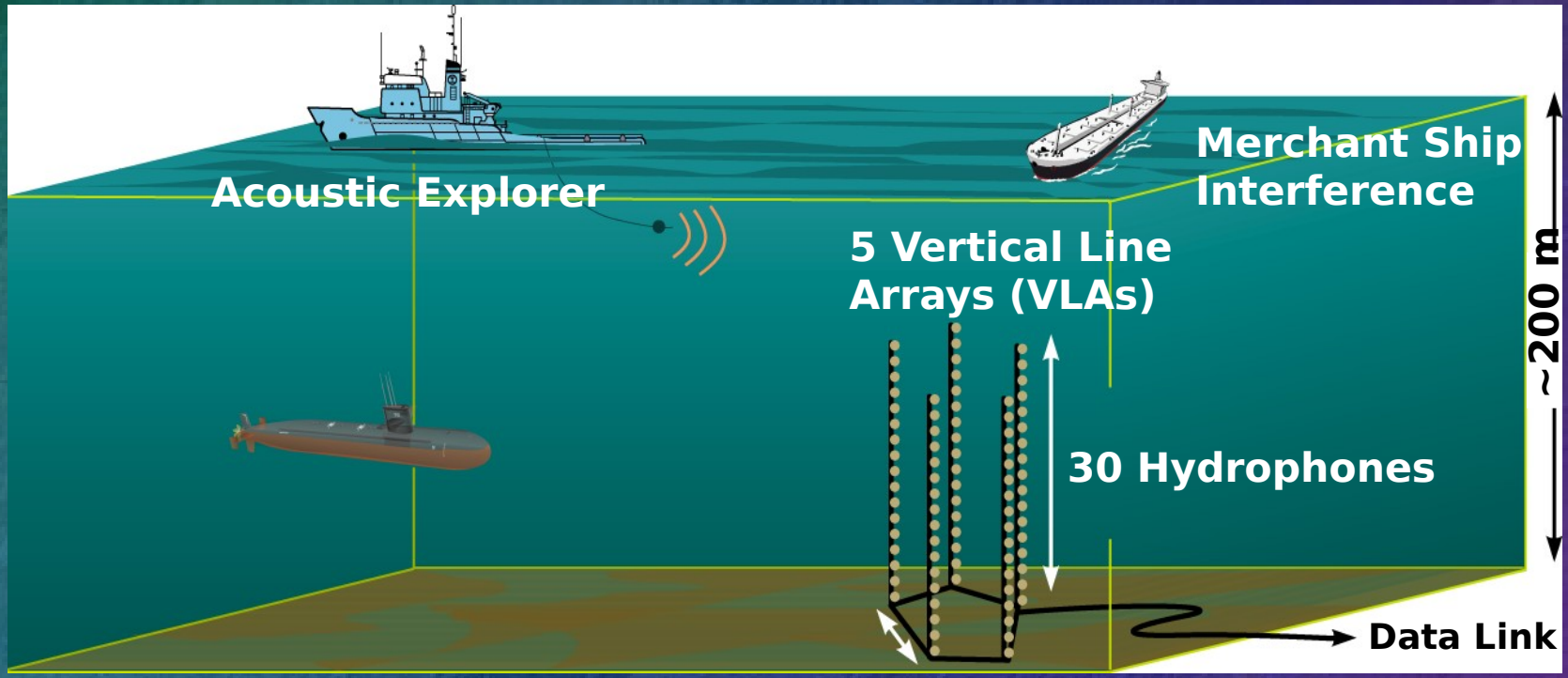


Shallow Water Multipath Channel



The Road Already Traveled !

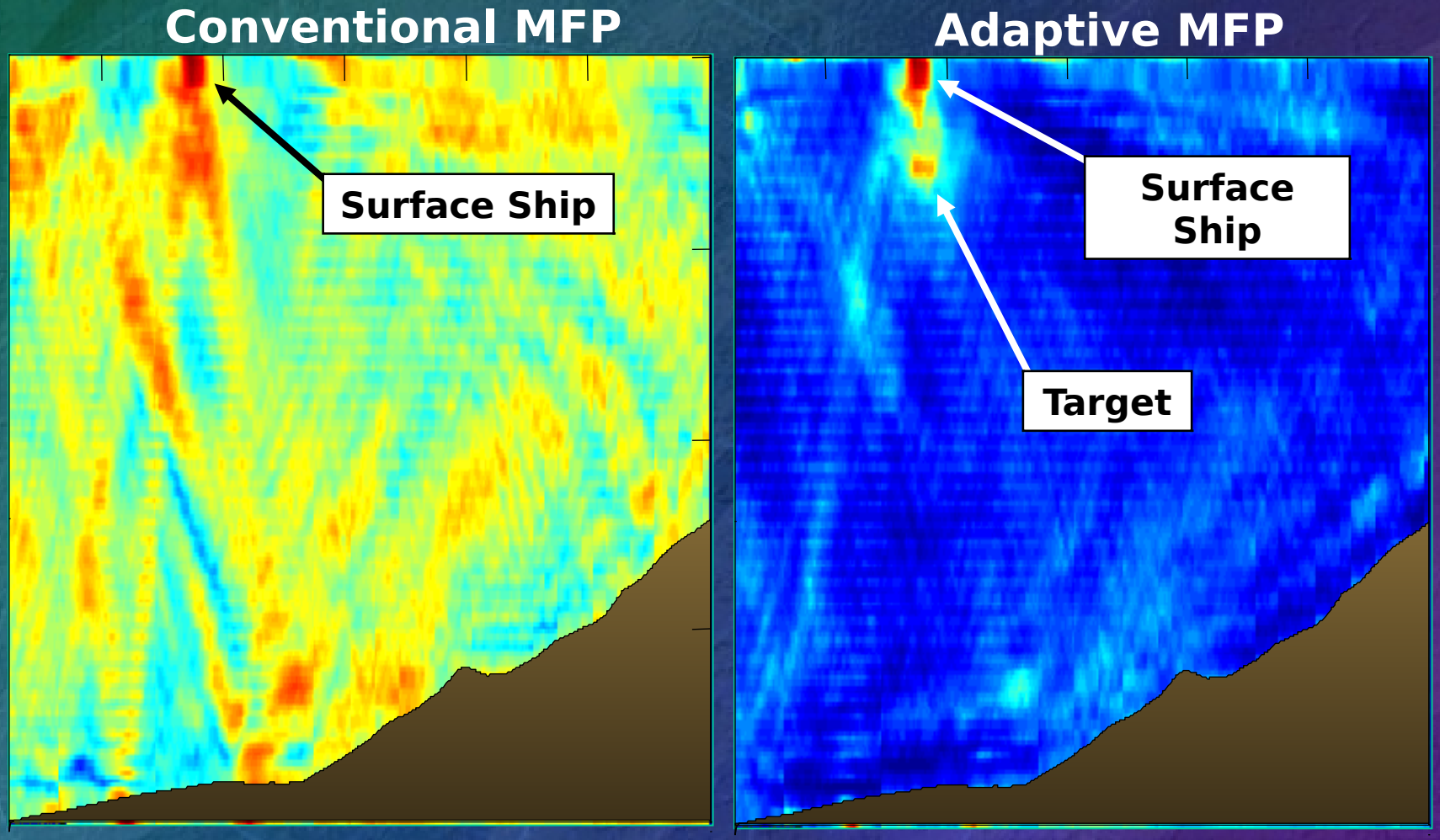
Santa Barbara Channel Experiment (SBCX)



Objectives

- Establish fundamental limits to signal and noise gains
- Extrapolate measured performance to other threats, environments, and sensors of interest

Adaptive Target Localization

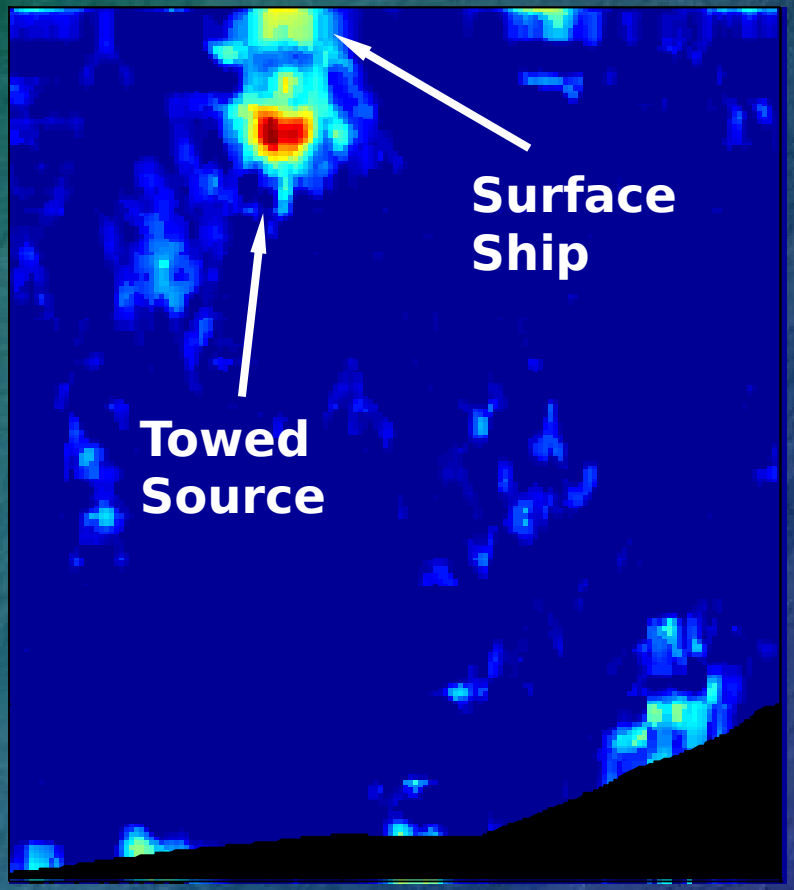


AMFP utilizes adaptivity and environmental knowledge to provide correct localization

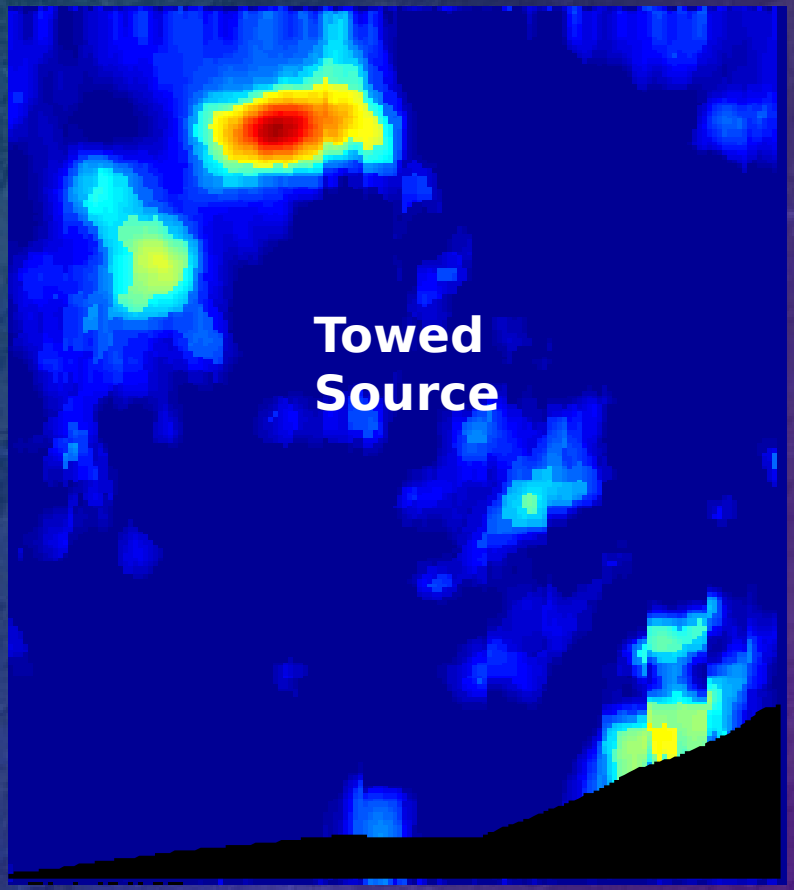
Adaptive MFP
with Mode Filtering

ATO

Full Rank AMFP



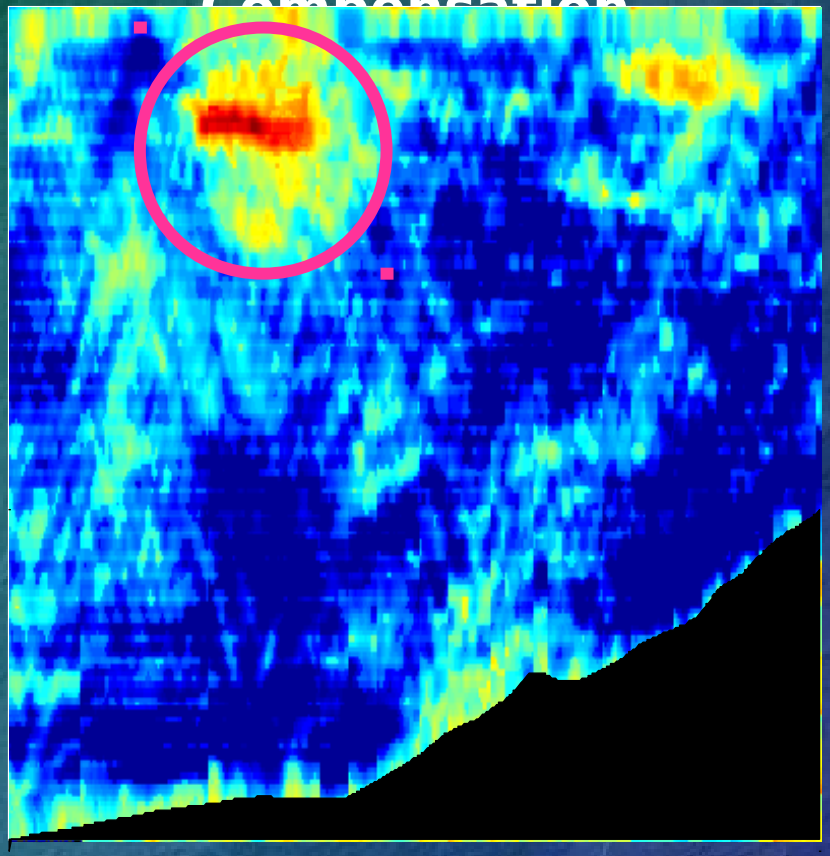
Mode Filtered AMFP



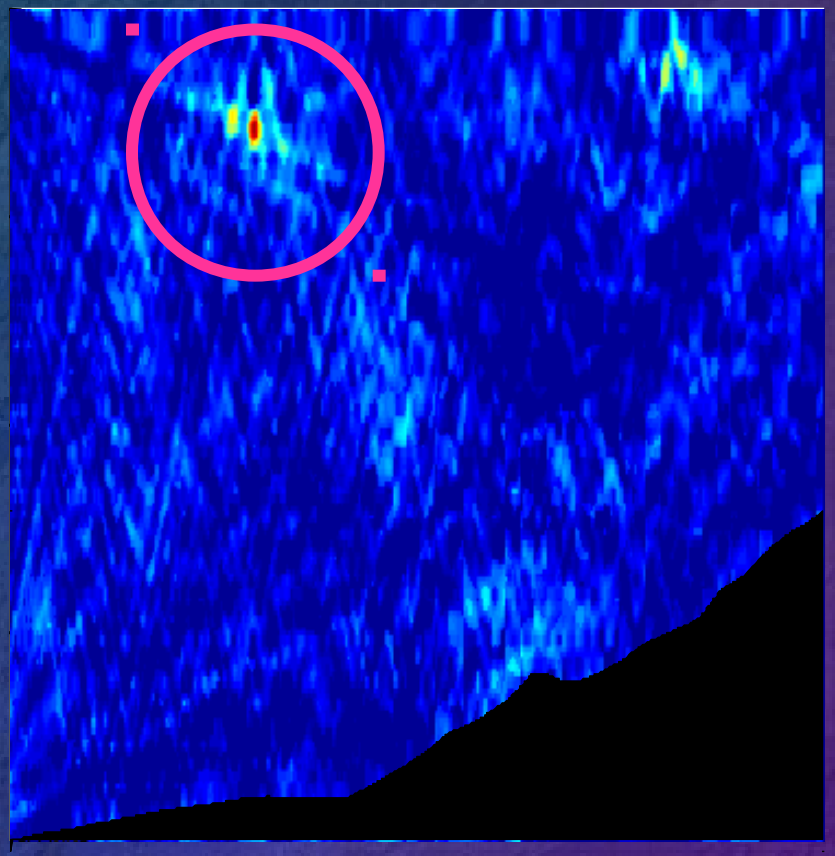
Designed to remove energy from surface interference while retaining submerged source !

Motion Compensation

Without Motion Compensation



With Motion Compensation



- Adjusts for phase difference and amplitude ratio
- Increases signal gain and mitigates

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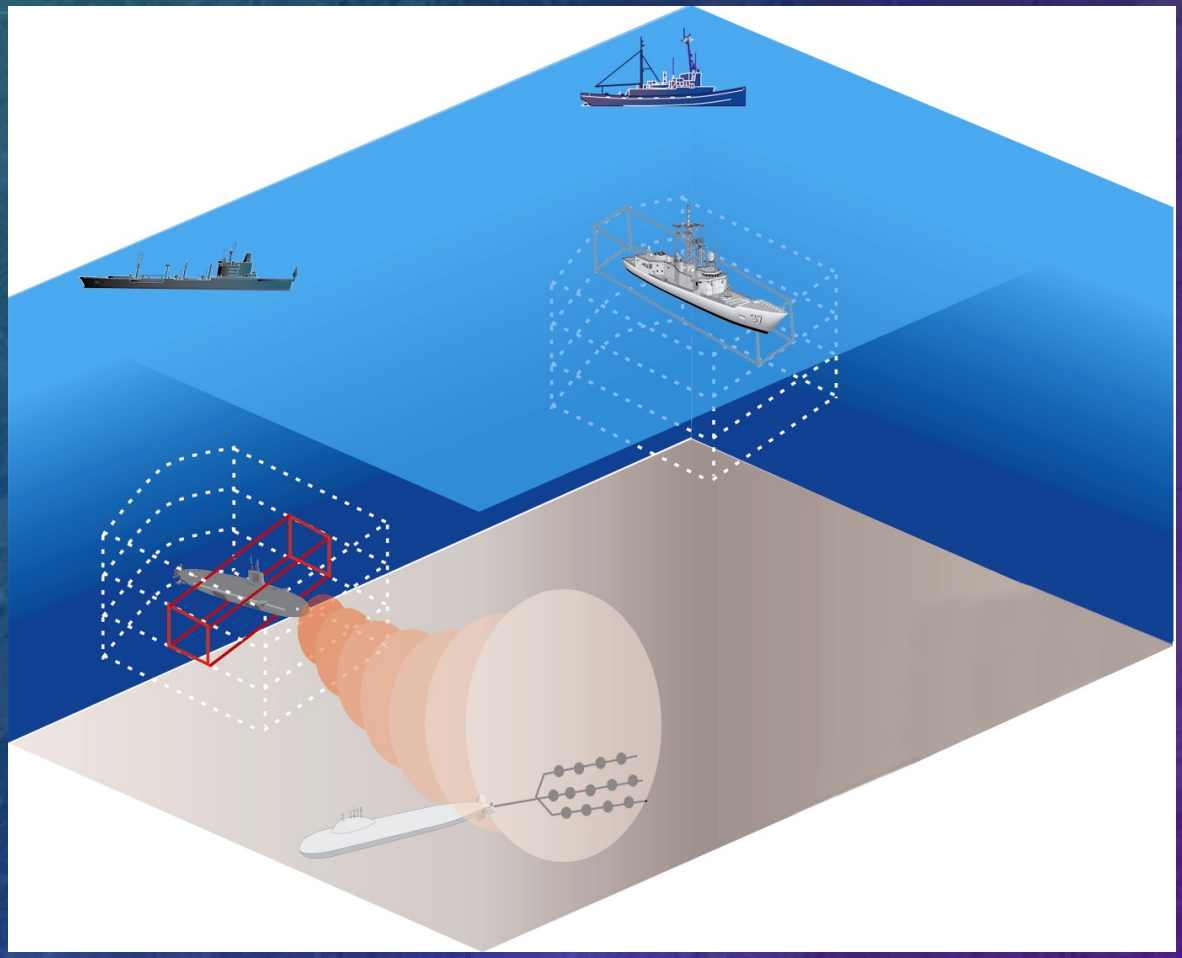
Target sensor: TB-29-like horizontal line array

- Large aperture with many elements
- Heading sensors to support advanced processing



Revolutionary Tactical Control for Littoral ASW: > 10 dB Gain in Figure of Merit

Approach

- Extend approaches developed to tactical systems
- Integrate advanced processing techniques
- Utilize high-quality, ground-truthed tactical data sets
- Conduct system analysis for performance assessment
- Conduct focused sea tests and experiments

We Need Your Help!

Technology Areas

- Systems Analysis
- End-to-End processing systems
- Advanced beamforming concepts
- Automation
- et al

Procurement Plans

- Broad Agency Announcement
- Unsolicited white papers

New Ideas Needed

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